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MANAGING COMPLEX PROGRAMS IN A POST-LSI ENVIRONMENT

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From the mid-1980s to the present, program management of large-scale, Department of Defense (DoD) acquisitions has been characterized by a trend away from government oversight and control toward greater privatization. The limits of privatization have been reached with the evolution to *lead system integrators* (LSIs), which assume such traditional government roles as requirements determination, systems trades and program management. External forces played a major role in the evolution of these practices:

A defense procurement *holiday* throughout the 1990s significantly reduced defense procurement spending and commensurate programs to manage;

Cumulative reductions (approximately 50 percent) in the DoD acquisition workforce left government program managers without required organizational expertise;

Evolution of families of systems (i.e., systems of systems) development strategies increased the complexity of the systems developed and management responsibilities; and

Reform initiatives that permitted wider latitude in privatization or competition of formerly government-only responsibilities.

This paper examines an evolution of government program management from a period of large government organizations chartered with detailed oversight response-bilities, to the present, which is characterized by small, core-government staffs providing limited insight of contractor activities. A media survey of the effectiveness of the LSI strategy is conducted. Statutory remedies and regulatory changes that have been drafted and subsequently enacted are also examined. Lastly, the paper proposes a basis for DoD acquisition management policy initiatives that will transition certain program management responsibilities and expertise back to the government following this period of extensive privatization. Because the government acquisition workforce is not currently sized or trained for these expanded responsibilities, policy effects and recommendations are explored.

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MANAGING COMPLEX PROGRAMS IN A POST-LSI ENVIRONMENT

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ABSTRACT

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TABLE OF CONTENTS

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MANAGING COMPLEX PROGRAMS IN A POST-LSI ENVIRONMENT

INTRODUCTION

Acquisition Reform Cycles

From as long ago as World War I, the armed forces of the United States, Congress and American industry have sought improvements in how weapon systems are developed and acquired.[1] Specific use of the term we use today—*acquisition reform*—dates back to the 1950s, and was used then to describe regulatory and statutory directives aimed at improving the acquisition processes. Among these statutes, the Defense Reorganization Act of 1958, focused heavily on acquisition reform.[2] Acquisition reform isn't a fad or modern-day manifestation, nor does the term describe particularly revolutionary approaches. Much of what constitutes modern acquisition reform initiatives has precedent somewhere in history.

Throughout history there is an almost predictable *cycle* of acquisition practices evolution, regulation and reform. This reform cycle resulting in regulatory and statutory change has repeated on several notable occasions, first during the inter-war years with aircraft development following World War I, and more recently, the sweeping Packard Commission findings in 1970 and 1986.[3] Each of these congressional and regulatory interventions was undertaken in response to perceptions that the services were managing programs inefficiently or ineffectively. Typically, however, the services' management of programs reflects the necessity of the moment: the nature of the technology under development, the military urgency or ascendency of the required capability, and the regulatory and statutory environment (most importantly, budgets). When Congress suspects the services' management practices require legislative remedy, the result is historically a form of what we've come to describe as *acquisition reform*.[4]

The defense acquisition community is again facing change in the form of congressional intervention in response to perceptions of improper management. The services of the Department of Defense (DoD), following a decade of lean procurement budgets in the 1990s, faced with increased system complexity, and significant reductions in the government acquisition workforce, adapted a controversial strategy for

modernizing. The new strategy has focused on awarding work to civilian industry-led lead system integrators (LSIs) to develop highly-complex systems of systems (SoSs) with reduced government oversight. These SoS programs include the Army's Future Combat Systems (FCS), the Navy's Littoral Combat Ships (LCS), and the Coast Guard's Deepwater program, among others. LSI contractors perform roles traditionally reserved to the government, including requirements development, program management and systems engineering. [5]

Because of the size and scope of these contracts, and the controversy of transferring formerly government responsibilities to private industry, Congress has taken special notice of LSIs. The General Accounting Office (GAO), the Congressional Budget Office (CBO) and others have increased scrutiny over this contracting strategy, investigating concerns that LSIs are not performing well, transfer too many core-government functions to defense contractors, and may experience conflicts of interest.[6] In response to the findings of these reports, Congress is enacting legislative measures that restrict or ban the use of LSIs in the DoD.[7]

Since LSIs are an adaptation to a previous acquisition statutory and fiscal environment, the congressional initiatives will result in yet another adaptation by the services. This paper explores the effect of current and proposed legislative changes on the use of LSI contracts in the DoD, specifically the impact of these changes on the Army's acquisition workforce and policy. The paper uses a perspective of historical cycles of adaptation to identify how the Army might adapt acquisition policies to accommodate the legislative initiatives.

To fully understand the nature of the use of LSIs by the Army and the DoD today, the paper will first examine the environment that drove the use of LSIs. Following that, the paper highlights the nature of congressional concerns specifically addressed by legislation. The paper then examines how these legislative changes affect the performance of acquisition organizations. The paper concludes by exploring proposed approaches to adapt acquisition policies to the new legislative environment and recommends areas for further research.

LSIs in DoD and Army Future Combat Systems

This section describes acquisition reform in terms of recurring cycles of adaptation by the services to congressional direction and the strategic environment. LSIs are presented as an adaptation to the acquisition environment and statutes governing military acquisition. It provides an example of early adaptation from the inter-war years, and then explore LSI contracts in that context. Lastly, this section discusses why the Army specifically chose the LSI strategy for development of FCS.

The Reform Cycle: Historic Perspective

A good case study of the cyclic nature of military acquisition strategies is found in the development of combat aircraft following World War I. Aircraft technology was new and developing rapidly and the Army's Ordnance Department was perceived as overly bureaucratic and slow to respond to emerging capabilities. This prompted a decision that turned military aircraft development largely over to civilian industry.[8] Still, the services were struggling to keep up with rapid technical advancements in the civilian aviation industry. The technology was turning so quickly, in fact, that by the time an aircraft requirement could be defined, contract awarded, prototype produced and tested, and then manufactured in quantity and fielded, the delivered product was considered obsolete.[9]

The Army Air Service adapted to this environment by awarding non-competitive contracts for *experimental* aircraft, from whose specifications, the Army could then compete for production. The aircraft manufacturers didn't appreciate the arrangement, since they tended to underbid prototype work in the hope of recovering on production contracts, which were subsequently awarded to *low bidders* unencumbered with the amortized costs of prototype work. Today, this practice is referred to as *buying in*. By forcing competition following a *low-bid* prototype, the *winner* was shut out from production profits. The aviation contractors sought relief from Congress. But the legislative fix largely upheld competitive standards (the Air Corps Act of 1926). [10]

Denied a legislative remedy from competition, the military and aviation industries were forced to find accommodations in practice. This adaptation resulted in the industry practice of *buying in* through research and development, and the military responding by

awarding sole source production contracts through the use of a regulation that permitted limiting competition when technology deemed it *impractical*. [11]

This example of cyclic adaptation occurred prior to World War II, but could similarly be debated today in the modern context of defense transformation. As will be presented in this paper, several large-scale DoD modernization programs have adopted management strategies considered unorthodox by Congress.

Lead System Integrators

A *lead system integrator* (LSI) is "a contractor, or team of contractors, hired by the federal government to execute a large, complex, defense-related acquisition program, particularly a so-called system-of-systems (SoS) acquisition program."[12] While similar to prime contracts, which develop one complex system composed of several subsystems, SoS approaches are aimed at acquiring a variety of platforms simultaneously.

The technical need to develop multiple platforms in parallel is driven by desires for integration and interoperability. To achieve synergistic, system-wide effects, the platforms must conform to demanding integration requirements. If these requirements are allocated separately and managed independently by multiple, uncoordinated developers, compromise in the integration specifications might result in lost system-wide capability.[13] In effect, to preserve optimum system performance, lower system (platform) trades may need to be made, that might not otherwise be possible if the platform is developed by independent contractors.

Given that system complexity has been increasing for years, it is reasonable to question why the DoD hasn't previously used LSIs to accomplish systems integration. Historical systems development efforts have been more piecemeal, integrating systems with other legacy platforms after development through costly adaptation. The reasons for this are varied and include affordability, maturity of technology or innovative breakthrough, and the urgency of the threat.

Service acquisition budgets haven't historically supported modernization beyond a piecemeal, serial approach. The Army might develop and field a new tank one decade and pursue an upgraded helicopter the next. Typically, budgets do not support wholesale fleet upgrades of multiple platform types. It is axiomatic that modernization is very much

a factor of affordability—how much obligation authority the services are given to spend. Following the terrorist attacks of 9/11, however, the DoD's modernization program has been better funded, and the services have made financial commitments to transformation a centerpiece of their modernization programs of record. In fact, despite the demands of fighting wars in Iraq and Afghanistan, growth in investment accounts—procurement plus research, development, test and evaluation (RDT&E) funding—has accelerated. This is summarized in a January 2007 analysis of the post 9/11 growth in DoD modernization accounts by the Brookings Institution:

> In the short span of five years, procurement expenditures are estimated to have increased 45.5 percent, while RDT&E spending for nascent weapons programs are projected to have increased an astonishing 57.3 percent in real terms…As a consequence, the weapons acquisition portfolio has swelled, rising from $951 billion in September 2001 to $1,609 billion in September 2005, of which only $658 billion has been paid for. This exceeds even the inflation-adjusted Reagan-era peak in fiscal year 1987. [14]

Similarly, scientific discovery or technological innovation is often haphazard and unevenly distributed, with evolutionary developments on widely varying schedules as well. An evolutionary advance in infrared sensors may not mature at the same time as a new engine technology. Choreographing the maturation and application of technologies to any one system is challenging enough, but across a system of systems (SoS) is an order of magnitude more complex.[15]

The nature and urgency of the threat is also evolutionary. As an example, during the 1970s and 1980s the Army was engaged in an armor/anti-armor race with the former Soviet Union. As shaped-charge penetrators gave way to kinetic-energy penetrators, armor systems became thicker and harder. Eventually, appliqué armor kits were deployed, and finally reactive armor tiles. In response to these armor advances, anti-armor technology developed larger diameter explosive charges, larger-bore tank main-guns, long-rod kinetic penetrators, pre-cursor warheads and later, tandem warheads that could defeat the latest advanced armor.[16] Integrating each of these advances and adaptations onto legacy platforms strained the original specifications of combat platforms to the point of compromise. The Army's M1A2 main battle tank now weighs in at approximately 70 tons and its strategic mobility (i.e., transportability) is severely

compromised as a result of numerous, serial technical upgrades and adaptations to the threat.[17]

The combination of these effects presents weapons developers with the challenge of integrating weapons systems that are comprised of legacy technologies partnered with modern upgrades. As SoSs further complicate matters, these modernization programs are dispersed in time across decades as budgets and bureaucratic progress allow. The resulting mix of systems is a technological hodgepodge that often does not work or does not integrate well. This has raised questions among those charged with oversight of defense procurement, particularly Congress.

The defense procurement bureaucracy itself contributes to the disjointed nature of how weapons are acquired. The bureaucracy moves slowly in response to external changes, developing requirements among numerous service stakeholders and evaluating technologies to satisfy requirements, while meeting various legal, fiscal and contractual hurdles imposed by law. As a result, frustrated military departments have sought methods to cut through the bureaucracy. [18] Broad interpretation of the Packard Commission (Packard II) findings on streamlining the acquisition process have opened the door to privatization of some functions that were formerly the domain of the government bureaucracy.[19]

At the same time that weapons were becoming more complex and integration requirements were increasing, the defense acquisition workforce was being reduced as defense budgets declined. As stated in the March 2007 Congressional Research Service (CRS) Report to Congress on the use of LSIs, services turned to industry as a source of expertise for management of complex programs:

> In recent years, federal agencies like the Department of Defense (DoD) have turned to the LSI concept, in large part, because they have determined that they lack the in-house, technical, and project-management expertise needed to execute large, complex acquisition programs. DoD states that its acquisition workforce was reduced by more than 50 percent between 1994 and 2005. [20]

Future Combat Systems

The Army's FCS is an example of an SoS development approach using the LSI acquisition strategy. The FCS program is simultaneously developing and integrating new, *leap-ahead* technologies that will initially equip, or transform, one-third of the Army. The complete SoS includes two classes of unmanned ground vehicles; two classes of unmanned air vehicles; eight manned combat platforms, missiles, launchers, multiple sensors; the soldier as a system; and a network to link the elements of the systems together. The FCS program is more than just development and fielding of new materiel; it includes development of new warfighting doctrine, organizational structures, training, and leader development as well.[21]

To appreciate the size and complexity of FCS program management, it might be useful to understand the program in terms of what it is replacing. Each of the platform, sensor and network development programs, if pursued independently under the traditional acquisition approach, would comprise an Acquisition Category I (ACAT I) or major defense acquisition program individually. The FCS LSI structure is intended to provide unified, holistic management of all these programs at once, thus promoting efficiency and streamlining. But the real challenge with the FCS program isn't the individual programs themselves; it is the integration and synergy of the SoS, the interfaces and distribution of complementary requirements and specifications among the components. [22]

For example, in order to achieve overall system survivability requirements, information requirements are allocated to the network. This enables the combat platforms to survive with reduced platform defenses by accomplishing the goal of survivability in a more distributive manner, leveraging stand-off detection and engagement or threat avoidance. If the network is developed independently (i.e., outside the FCS program) the network developer might seek optimum solutions that compromise information requirements that are critical to ensuring platform survivability. Beyond survivability, other critical performance factors of FCS are achieved as a system including lethality, mobility, and maneuverability. Multiplying these factors across all 14 platform classes,

their contractors, subcontractors, and vendors, and tying these together with a network, results in a program management complexity challenge that is without precedent.[23]

As described in a *Defense Acquisition Review Journal* report on FCS management (Flood and Richard), schedule urgency, FCS program complexity, and concerns of the adequacy of the government acquisition workforce drove the Army to the LSI concept:

> In order to meet the aggressive timeline laid out by the Chief of Staff, the Army formed a partnership with the Defense Advanced Research Projects Agency (DARPA). The DARPA had the capability of using contracting instruments that were more flexible and responsive than those available to the Army. …For the FCS program, this was the Army's first utilization of contractors to do what had traditionally been done organically.
> The primary value of using an LSI for the FCS program was in the area of manpower. Several years of downsizing in the Army acquisition workforce, combined with an order of magnitude increase in the size and complexity of the program, created an immense capability gap between the amount of human capital available and what was required to execute the FCS program. According to one senior Army leader, "We don't have the personnel or the expertise" (Source #1, 2005).[24]

The effects of increased system complexity and increased program spending, compounded by a smaller government acquisition workforce and a compressed development schedule, led to the adaptation of the LSI contracting strategy. Faced with a need to develop and field a complex SoS based on multiple, integrated families of new platforms, with a significantly reduced government acquisition workforce, and following a decade of increased reliance on contractor responsibility, the Army elected to delegate program management, systems engineering and integration responsibilities for the FCS to an LSI team consisting of The Boeing Company and the Science Applications International Corporation (SAIC).

In the next section, we will describe how the DoD experiment with LSI management is faring and compare and contrast the Army's experience with that of the other services.

LSI PERFORMANCE AND ARMY FUTURE COMBAT SYSTEMS

In the previous section, we explored why the Army chose the LSI strategy for the development of FCS. Faced with the challenge of developing a highly-complex SoS with a government acquisition workforce perceived as too small or lacking expertise for the mission, the Army chose an acquisition strategy that has become increasingly common in DoD today, the LSI. This section explores the performance of LSIs in the DoD and specifically how the Army's LSI team of Boeing-SAIC is performing on FCS.

Successful Performance of LSI-type Contracts

The previously referenced *Defense Acquisition Review Journal* article by Flood and Richard describes management-related problems accumulating to the FCS LSI. Based on interviews of senior leaders associated with FCS, the authors derived primary causes for management difficulties on FCS. These are presented as a legacy culture and organizational structure that has not adapted to the *new* teamwork approach, and a more traditional failure to accomplish a detailed program specification and statement of work before awarding the contract:

> There are two key elements to successfully implementing the LSI concept on a government program. First, it is critically important for the government agency implementing the LSI concept to develop the right culture within its own organization, and to restructure itself to mirror the LSI. Otherwise the program will experience the same pitfalls the Army has had with the FCS program. Second, it is equally important to write a solid program specification and LSI contractual statement of work to define the program as much as possible, especially the roles and missions of the government and the LSI personnel. With a well written and well thought out program specification and statement of work, the task at hand becomes one of executing the "game plan" as opposed to searching for a way to achieve program success.[25]

It must be noted that among these reasons cited, the authors provide no reference to where LSIs have been implemented successfully elsewhere in government. Briefly, the authors have presented observations about problems the FCS LSI has had and documented those challenges, but have not tested their hypothesis by exploring LSI implementation elsewhere. Additionally, Flood and Richard's implication that the lack of "a solid program specification and LSI contractual statement of work" may contradict their initial justification for the LSI, as the government lacks "…enough manpower with

enough capability to perform the thousands of systems engineering and integration tasks necessary to develop the complex SoS that was to make up the FCS program."[26] If personnel resources were insufficient for staffing a traditional program management office's systems engineering division, they are likely insufficient to the task of defining the LSI specification and statement of work.

The causes of problems on FCS cited by Flood and Richard are certainly real; but lacking substantiation beyond FCS on similar programs, they should be considered anecdotal. These issues are potentially symptomatic of large, complex acquisition programs throughout the DoD. (This can't be proven either way from the evidence provided in the article.) In either case, this paper explores this hypothesis further by conducting a literature review of LSI performance throughout the government.

Literature Review of LSI Performance

A literature review of LSI contract performance turns up no independent, positive results for this type of management structure. The following are headlines, subjects, and excerpts of government publications, reports, and journal articles from our literature review of the subject.

On the Coast Guard's Deepwater LSI program, "Out of Its Depth," by Katherine Peters of *Government Executive*, September 19, 2007:

> As with many debacles, there were plenty of warning signs that the Coast Guard's massive $24 billion program to modernize the fleet was veering off course. The signs came long before last month, when Coast Guard Commandant Adm. Thad Allen announced that the service would cut its losses and scrap eight newly upgraded patrol boats, so flawed they are not seaworthy, and take over the role of lead systems integrator from Integrated Coast Guard Systems, a joint venture of Lockheed Martin and Northrop Grumman founded to manage the program known as Deepwater.
>
> The warning signs appeared in Government Accountability Office reports before the contract was even awarded in 2002 and in subsequent inspector general reports after the program began. There were warning signs among contractors and Coast Guard managers and engineers who witnessed shoddy work and flawed decision-making, only to have their concerns brushed aside or buried by supervisors or managers. There were the concerns raised by members of Congress, worried that the Coast Guard had lost control of a program whose management structure obscured accountability.[27]

From “Coast Guard Deepwater Program: Background, Oversight Issues, and Options for Congress,” by Ronald O'Rourke, CRS, June 22, 2007:

> The management and execution of the Deepwater program has been strongly criticized in recent weeks by the Department of Homeland Security (DHS) Inspector General (IG), the Defense Acquisition University (DAU), the Government Accountability Office (GAO), several members of Congress from committees and subcommittees that oversee the Coast Guard, and other observers. Between late January and mid-February 2007, House and Senate committees and subcommittees conducted several oversight hearings devoted partly or entirely to problems and concerns regarding the management and execution of the program.[28]

Also on the Deepwater program, “Coast Guard to Take Over Management of Fleet Upgrade,” *Government Executive*, April 2007, by Katherine Peters:

> During a briefing for reporters at Coast Guard headquarters, [Admiral] Allen also said the agency would decommission eight new 123-foot patrol boats that had been converted under Deepwater and had become a symbol of how the program had veered off course. The boats, which were expanded and upgraded versions of existing 110-foot patrol boats, had structural problems so severe the Coast Guard pulled them from the fleet last November until it could figure out how to render them safe for missions.
> Multiple engineering studies showed serious and varied problems with the ships' hulls. "Any strategy to permanently repair these cutters and return them to service would require an iterative, phased approach over a long period of time with uncertain costs and outcome," Allen said. Initial estimates put the cost at more than $50 million.[29]

Performance of the Navy LCS SoS development is summarized in “Navy official 'embarrassed' by cost overruns on combat ship,” Megan Scully, *Government Executive*, February 14, 2007:

> Chief of Naval Operations Michael Mullen said Tuesday he is "embarrassed" by hefty cost overruns on the Littoral Combat Ship, but said he expects to get the program back on track as early as next month.
> There is "plenty of blame to go around" between the defense industry and Navy officials who failed to adequately oversee the program, Mullen told the House Defense Appropriations Subcommittee during a hearing on the Navy and Marine Corps fiscal 2008 budget request.
> The Navy *pressurized* the LCS production schedule and costs projections, setting ambitious goals for the program, Mullen added.
> The Navy stopped work on the third LCS ship Jan. 12, after learning that the price tag on the first ship would total roughly $410 million—well above the

> $220 million the Navy expects to pay for future ships. The price of the third ship was expected to be much less than the first LCS, but still fall well over $300 million.[30]

On the performance of SBInet, a DHS SoS LSI, from "Big Contracts, Big Problems," *Government Executive*, by Robert Brodsky, Zack Phillips and Katherine Peters, August 15, 2007:

> Homeland Security, the Coast Guard's parent department, also has turned to Boeing to manage SBInet, a $2 billion effort to create a "virtual fence" along the border. The contract, which initially guarantees Boeing $67 million over three years but which auditors say could eventually cost as much as $30 billion, puts the contractor in charge of integrating sensors, cameras and other equipment to improve the Border Patrol's capabilities.[31]

SBInet contract performance is described further in the GAO report, "Observations on Selected Aspects of SBInet Program Implementation," October 2007:

> The SBInet contractor delivered the components (i.e., radars, sensors and cameras) to the Project 28 site in Tucson, Arizona, on schedule. However, Project 28 is incomplete more than 4 months after it was to become operational—at which point Border Patrol agents were to begin using SBInet technology to support their activities. According to DHS, the delays are primarily due to software integration problems. In September 2007, DHS officials said that the Project 28 contractor was making progress in correcting the problems, but DHS was unable to specify a date when the system would be operational. Due to the slippage in completing Project 28, DHS is revising the SBInet implementation schedule for follow-on technology projects, but still plans to deploy technology along 387 miles of the southwest border by December 31, 2008. DHS is also taking steps to strengthen its contract management for Project 28. [32]

Lack of government oversight of the SBInet program is identified as a contributing factor to the cost and schedule growth on the program:

> The SBI PMO tripled in size during fiscal year 2007, but fell short of its staffing goal of 270 employees. Agency officials expressed concerns that staffing shortfalls could affect the agency's capacity to provide adequate contractor oversight. In addition, the SBInet PMO has not yet completed long-term human capital planning. [33]

Two other LSI-like managed programs are referenced in the literature: the Air Force's Transformational Satellite Communications System (TSAT), and the Missile Defense Agency's (MDA's) Ground-based, Mid-course Defense (GMD).

In May 2006, the GAO published an update on the TSAT program entitled "DoD Needs additional Knowledge as it Embarks on a New Approach for Transformational Satellite Communications System." Technically not listed as an LSI, Booz Allen Hamilton performs essentially the same function as an LSI, and is listed as responsible for "…overall systems engineering and integration…" of the TSAT program. The GAO report summarizes TSAT program performance:

> The Department of Defense is not meeting original cost, schedule, and performance goals established for the TSAT program. When the program was initiated in 2004, DoD estimated TSAT's total acquisition cost to be $15.5 billion and that it would launch the first satellite in April 2011. TSAT's current formal cost estimate is nearly $16 billion and the initial launch date has slipped to September 2014—a delay of over three years. Furthermore, while the performance goal of the full five-satellite constellation has not changed, the initial delivery of capability will be less than what DoD originally planned. After DoD established initial goals for TSAT, Congress twice reduced the program's funding due to concerns about technology maturity and the aggressiveness of the acquisition schedule. DoD developed the initial goals before it had sufficient knowledge about critical TSAT technologies.[34]

The MDA's GMD LSI (Boeing) appears as DoD's first LSI, awarded in 1997.[35] But while several publications refer to the Boeing contract as an LSI it is not formally described as such by the GAO. The GAO information on Boeing's performance as the GMD lead contractor is summarized within the latest GAO report, "Missile Defense Acquisition Strategy Generates Results but Delivers Less at a Higher Cost," (March 2007):

> During fiscal year 2006, MDA fielded additional assets for the Ballistic Missile Defense System (BMDS), enhanced the capability of some assets, and realized several noteworthy testing achievements. For example, the Ground-based Midcourse Defense (GMD) element successfully conducted its first end-to-end test of one engagement scenario, the element's first successful intercept test since 2002. However, MDA will not meet its original Block 2006 cost, fielding, or performance goals because the agency has revised those goals. [36]

The MDA's flexibility in managing BMDS development is derived more from its status as a pre-system development and demonstration program, essentially in concept exploration phase, as described in the same GAO report:

> Because the BMDS program has not formally entered the system development and demonstration phase of the acquisition cycle, it is not yet required to apply several important oversight mechanisms contained in certain acquisition laws that, among other things, provide transparency into program progress and decisions. This has enabled MDA to be agile in decision making and to field an initial BMDS capability quickly. On the other hand, MDA operates with considerable autonomy to change goals and plans, making it difficult to reconcile outcomes with original expectations and to determine the actual cost of each block and of individual operational assets. [37]

As an early development system, the MDA GMD management may not serve as an apt comparison to full acquisition programs like the Army's FCS or Navy's LCS or Coast Guard Deepwater programs. But the cost, schedule and performance trends of GMD are similar to the experience at other LSI-like programs, with unplanned cost growth, schedule overruns, and performance slippage common among these programs.

Indeed, nowhere in the literature review conducted could be found a single, independent reference that an LSI was perceived to have delivered a product sooner, better or cheaper than a traditional, government-integrated program, allowing for obvious differences in program size. The most generous conclusions one could reach is that LSIs suffer no more or less from the same problems that government-led programs do, in terms of measurable performance. And this is without addressing the reasonable concerns of potential contractor conflicts of interest and program transparency.

Criticism of the FCS LSI

In the September 2007 issue of *Government Executive*, writer Greg Grant's article, "Image Makeover," describes the current state of the FCS program:

> FCS is in trouble, assailed by lawmakers because of its soaring price tag, and because of its unproven technologies. Many also question the contractual arrangement between the Army and Boeing Co., the program's lead contractor. The Army and Boeing say FCS, intended to equip a third of the Army's troops with new vehicles, has remained on budget and on time. That is not the case.

> Since the program was first announced, the Army and Boeing have slipped the development timeline by five years and have pushed the eventual fielding date out seven years. Initially, the program's cost was projected at $92 billion, but recent estimates by the GAO and the Office of the Secretary of Defense's in-house auditor say it's more likely to run somewhere between $203 billion and $234 billion.[38]

The FCS program is called out for additional management oversight and congressional review in the GAO's Performance and Accountability Report 2007:

> … the program is considered high risk and in need of special oversight and review. Since 2004, we have pointed out that the Army has far less knowledge about FCS and its potential for success than is needed to fulfill the basic elements of a business case. For example, the Army has yet to fully define FCS requirements, mature key technologies, and fully estimate costs. [39]

These conclusions draw largely from a previous, March 2006, GAO report entitled, "Improved Business Case is Needed for Future Combat System's Successful Outcome," which states:

> The Army has made significant progress defining the initial FCS system of systems requirements, having reached agreement on nearly 11,500. However, FCS requirements are not yet matched with program resources because the Army still faces the daunting task of defining about 90,000 more requirements for FCS's 18 individual systems ... The initial system-level requirements defined to date are likely to change as technical feasibility and expected costs of the system-level requirements become clearer...
>
> None of the FCS's 49 critical technologies were at an acceptable level of maturity when the product development began. Since the FCS program began, projected dates for maturing critical technologies have slipped, and some technologies are not expected to mature until very late—well into the design phases of the program and possibly into production. Other challenges have arisen as well. Several of 52 complementary systems considered essential to FCS may not be able to complete development when needed. Some of these programs have not yet been fully funded, and others are facing their own technical challenges. For example, the Joint Tactical Radio System could be a deciding factor in FCS's overall success, but it is being restructured because of significant development problems.[40]

The GAO's conclusions also reflect the CBO review of the FCS program released in August 2006, which raised concerns about the Army's ability to sustain FCS funding

and other modernization programs concurrently. According to the CBO, FCS cost growth may crowd out other Army procurement:

> The Army estimates that the FCS program will require $8 billion to $10 billion annually starting in 2015, when it plans to begin buying 1.5 brigades' worth of equipment per year. During the preceding five years, the program will have consumed increasingly larger shares of the Army's procurement budget: if the Army's procurement funding grew after 2011 at a rate equal to inflation—that is, if it remained at the same level in 2006 dollars—the FCS program's share of the service's planned $21 billion procurement budget would rise from almost 6 percent in 2011 to roughly 50 percent in 2015 and remain at or above 40 percent through 2025. (For comparison, the Army's purchase of ground combat vehicles during the 1980s peaked at 20 percent of the Army's total procurement budget.) Dedicating such a large proportion of the service's procurement funding to the FCS program would leave little money for purchasing other weapon systems (such as helicopters) or needed support equipment (such as generators and ammunition). [41]

Those CBO affordability projections are based on the program of record, however, and do not reflect possible program risk factors that could inflate the total annual cost of FCS to the point the program is unaffordable. Elsewhere, the CBO report summarized these risks as follows:

> According to the Army's estimates, total annual costs to purchase the various FCS components could approach $10 billion. However, if such costs grew as those of similar programs have in the past, annual costs could reach $16 billion.[42]

The Army and Boeing's Position on FCS

The Army and its LSI contractor, Boeing, have disputed these claims; however, changes in program content, delivery schedule and capability (specifically, the reduction from 18 systems to 14) are a direct result of funding reductions.[43] Responding to the CBO criticisms, Army spokesman LTC William Wiggins, stated that the Army considers FCS fully on track:

> 'During the August 2006 In-Process Preliminary Design Review, critical FCS technologies were noted as maturing on or ahead of schedule,' …'By December 2006, nearly 80 percent of critical FCS modernization technologies will be fully mature in accord with DoD standards. By October 2008, all critical technologies will have reached this standard.'[44]

Boeing, upon the recent completion of the FCS Engineering Maturity (EM1) assessment milestone, affirmed their perception that the program remains on schedule:

> 'EM1 is a crucial milestone for the FCS program that demonstrates we have sufficient design maturity to proceed toward the System-of-Systems Preliminary Design Review in early 2009,' said Dennis Muilenburg, vice president-general manager, Boeing Combat Systems and FCS program manager.[45]

It should be expected that the Army, the FCS program management team, and especially the developing contractor, will argue vigorously in defense of *their* program. Perhaps the most comprehensive and compelling independent defense of the FCS program is provided by the Heritage Foundation's Mackenzie Eaglen and Oliver Horn, in their December 2007 *Congressional Backgrounder* (number 291) "Future Combat Systems: A Congressional Guide to Army Modernization." This paper systematically counters the GAO and CBO criticisms of the FCS program, attributing program delays and cost growth to restructures initially recommended by GAO and CBO themselves. Cost growth is mainly a result of program modification to *spin-out* technologies to the current force faster, while maintaining planned deployment dates for FCS. Indeed, meeting requirements to *spin out* incremental upgrade capabilities to the current force, has resulted in an FCS program restructure and has added costs to FCS that were not in the original program plan.[46]

Summary of the FCS Case and LSIs

Criticisms of the FCS program do parallel the criticisms levied against other, similarly ambitious LSI-led SoS developments. As presented in the media survey above, once the complexity of these programs is fully understood, the programs have a tendency to grow dramatically in cost, while projecting less capability. Planned delivery of capabilities likewise slips, or becomes incremental, as the programs progress. The FCS program is arousing concerns similar to those of other LSI programs. Regardless of the reasons for these issues—discovery of new risks, imposed program changes by key stakeholders, evolution of requirements, budget cuts in the current year forcing program restructure—the parallels are no less consistent.

Affordability of FCS is a growing concern as the service may have to trade other needed procurement programs to keep FCS viable, especially if the risk factors inherent in FCS are realized as they have been in similar acquisition programs. Failing to make necessary cuts in other programs, which might leave the overall Army acquisition program unbalanced, would cost-limit the FCS program, resulting in further schedule delays, reduced capability, and inevitably higher total program costs.

While these results have shown themselves consistent with LSIs elsewhere, it is too soon, at this juncture, to conclude that FCS is somehow *failing*. The FCS program is still in an early development phase with much program definition still unfinished. Whether or not the Army and the FCS developer, Boeing, can successfully deliver FCS remains to be seen.

Summation of LSI Performance

This section began with exploring Flood's and Richard's hypothesis that FCS management problems are a function of culture, organization and an inadequate specification and statement of work. The media survey presented above leads to the conclusion that either all LSI-like contracts suffer the same deficiencies noted by Flood and Richard; or that LSI-like contracts are no more an effective means to accomplishing acquisition solutions that are "better, faster and cheaper" than traditional government-integrated programs. Inasmuch as the problems encountered on LSI-type contracts are similar to those experienced by contracts with lesser aggregation of responsibility to the private sector, one can only conclude the latter, and that these results are consistent with traditional (government-led) program management methodologies. The LSI management structure has not proven itself an effective means in countering the challenges inherent in management of large, highly complex SoSs.

The adaptation of LSIs as an acquisition strategy reflects the services' migration toward the private sector for management of larger, more complex programs in an era of reduced government manpower. Encouraged by the Packard privatization initiatives, LSIs take the "customary role of a prime contractor to the next level" and effectively transfer program management responsibility and requirements development to the private sector. [47]

In this section, we've concluded that the FCS LSI is experiencing similar challenges as other LSIs and have experienced performance in terms of cost, schedule and capability that parallels that of previous government-integrated programs. The selection of an LSI management strategy for FCS is an adaptation to an environment of increased program complexity at a time when the government workforce is too small or lacks the expertise to accomplish the mission. The record on LSIs is proving that this strategy is no more effective in managing complex programs.

In the following section, the conclusions that Congress has reached in their review of LSI performance is explored. The issues uncovered by Congress are more fundamental than contract performance alone, and include concerns regarding the loss of government flexibility, management transparency and potential conflicts of interest among LSIs.

CONGRESSIONAL INITIATIVES AND SERVICE ADAPTATION

In the previous section, we reviewed the performance of the Army's FCS program and the increasing reliance on LSIs throughout the government. We've also explored the LSI initiative as a natural acquisition strategy adaptation for programs of increased system complexity and during an era of reduced government acquisition personnel and expertise. Our literature review of LSI performance indicated that large, complex SoS development fare no differently under LSIs than traditional, government-integrated programs. The FCS LSI has experienced similar criticisms as other LSIs. This section reviews congressional initiatives that address these and other concerns over performance of LSI contracts.

Congress Bans LSIs

LSI contracts are conspicuous due to their size in dollars, technical scope, and controversial privatization of formerly government-core functions of program management and systems engineering and integration. Additionally, as our media survey in the previous section concluded, the poor performance record of LSI-like contracts on cost, schedule, and technical requirements has made this strategy a target for critics. It is therefore understandable that congress would seek its historic role in legislating corrective action.

The December 10, 2007, *DefenseNews* front page headline article by William Matthews, "An End to Lead System Integrators," refers to language in the fiscal year 2008 Defense Appropriation Act: "Congress sought to close a troubled era in defense contracting Dec. 6 by banning the use of LSIs after Oct. 1, 2010." Future LSIs are now effectively banned by the congress, but existing LSIs are grandfathered by the bill, through the period of low-rate initial production (LRIP). No future LSI contracts may be awarded and existing LSI contracts must transition to government oversight and integration over time.[48]

The Matthews article indicates that Congress' concern over LSI-type contracts transcends performance, and addresses concerns that LSI contractors have assumed too much of a government role (quoting an unidentified congressional staffer):

> The ban's 2010 start date is intended 'to give services three years to beef up their in-house acquisition staffs so that when it [the LSI ban] kicks in, they will have enough people to manage their programs,' the staffer said.[49]

The Congress' principle concerns with the LSI concept appears to be a fundamental disagreement over the role of contractors performing what congress perceives to be core-government functions, loss of transparency, and potentially conflicts of interest:

> Some observers have expressed concern that LSI arrangements can result in the government having insufficient visibility into many program aspects, such as program costs, optimization studies conducted by LSIs for determining the mix of systems to be acquired, LSI source-selection procedures, and overall system performance.
>
> …Some observers have expressed concern that LSI arrangements can create conflicts of interest for an LSI in areas such as determining a system's requirements and soliciting, evaluating, and hiring contractors.[50]

Other concerns include the limits to future competition. Once an LSI has been awarded, for example, it is understandably difficult for a competitor to acquire expertise to effectively challenge the LSI in a follow-on competition.[51]

While Congress' intent with regards to future LSIs is unequivocal, it remains to be seen how congress will specifically police existing LSI contracts. Besides banning use of the term *lead system integrator* in future government contracts, agencies could simply

re-designate existing LSIs as *prime contracts* yet retain full integration authority with the contractor lead. How congressional language will be interpreted and enforced should prove interesting. Regardless, congress clearly expects to see the principle rationale for LSIs—a lack of government acquisition workforce expertise—to be remediated among government agencies.

Managing Complex Programs in a Post-LSI Environment

One of the first tests of competing LSI-type contract work will likely be with the MDA's GMD program. As described in the previous section of this paper, the GMD program lead is not technically an LSI, but a very large prime contractor in early exploratory development. Effectively, however, Boeing serves as an LSI to the GMD program and is the first known use of an LSI-type contract in DoD.[52] The MDA is now considering how it might proceed to a competition to award the next phase of work in GMD, because Boeing's current contract for GMD expires in 2009:

> The MDA has not made any decisions on future contracting arrangements for the Ground-based Mid-course Defense System (GMD), according to an agency official. Options include holding a new competition for prime contractor and breaking up the GMD work into separate contracts, the official said.[53]

The article is unclear whether the MDA would consider a formal LSI arrangement with Boeing for the next phase of development. This is unlikely, considering the recently enacted ban for future work by LSIs from Congress, particularly for production work beyond LRIP. But there are clear indications that MDA anticipates breaking out some aspects of the GMD program in its acquisition strategy:

> While keeping options open, the MDA currently anticipates awarding a prime contract for advanced-capability development work on the various elements of the GMD system—including ground-based interceptors, and sensors on land and at sea—with a separate contract for logistics for the fielded systems, according to the notice [a Request for Information was released to industry on Nov 20, 2007]. Boeing performs both functions under its current contract. [54]

It should be of interest to observe how the MDA transforms its acquisition strategy for the GMD program in 2009. How MDA adapts its government oversight

responsibilities may serve as an example for transition of similar LSI-like programs in the future.

The Coast Guard, on the other hand, has terminated the Lockheed-Northrup Grumman LSI for the Deepwater program, due to poor performance and cost growth:

> In a major reversal, Coast Guard Commandant Adm. Thad Allen announced Tuesday that the service would take over as lead systems integrator for all assets acquired under the problem-plagued $24 billion modernization program known as Deepwater.[55]

The Coast Guard's assumed management of Deepwater will also serve as an example for other acquisition programs that must rebuild their acquisition workforce:

> But the move to take back authority as the lead systems integrator may signal a shift in how the government manages large, complex acquisitions, particularly at the Pentagon and the Homeland Security Department, the Coast Guard's parent agency. In recent years, those agencies have pursued the purchase of increasingly complicated assets at the same time they have been losing expertise among contracting and technical staff. As a result, agencies have turned to contractors to do work formerly done by federal employees.
> "e relied too much on contractors to do the work of government," Allen said, citing a propensity on the part of the Coast Guard to favor meeting schedule goals over cost and performance goals. Both ICGS and the Coast Guard failed to effectively oversee the program, and both failed to predict and control costs, he said.
>
> Whether or not the Coast Guard will be able to do a better job managing Deepwater than ICGS has yet to be seen. The agency is in the process of reorganizing and reforming its acquisition workforce.[56]

Other government agencies with LSI-type contracts may benefit from the example of these two programs. Considering the congressional ban on future LSIs and work by LSIs beyond development and LRIP, all such current contracts may be expected to revert to government management in the next several years. How the Coast Guard and the MDA executes this transition to traditional government integration and oversight responsibilities will potentially serve as a blueprint for other programs in other agencies.

Implications for FCS and the Army

The Army's FCS program, as an LSI-led acquisition program, cannot continue as structured and comply with congressional intent. Some form of program re-organization

and restructure will be required. As an existing LSI, the FCS program is *grandfathered* under the congressional language, but must revert to traditional government integration in the future, prior to full rate production at the latest. Current FCS program plans indicate delivery of the first Brigade Combat Team sets beginning in 2015.[57] It would appear that compliance with congressional intent requires the government assumption of the integration and program management role by that date.

The FCS program, however, was not structured for, nor is the Army acquisition workforce currently prepared to transition the integration role back to the government. The congressional direction, if carried out by the Army today, would result in a significant, constructive change to the FCS LSI contract. Likewise, just as there was insufficient government expertise to integrate FCS previously, that expertise will be insufficient when the role reverts to government control unless the Army takes steps to rebuild its acquisition workforce. Neither of these actions is required immediately by the congressional direction, nor should these changes be implemented in a manner that jeopardizes FCS program success. The implications of the congressional change for the Army and FCS indicate a deliberate and planned transition that will coincide with planned production in 2015.

In this section, we described congressional direction that results in the banning of LSI contracts by October 2010. Existing LSI-type contracts must transition to government control prior to entering production phase. MDA's GMD program will likely compete future work currently executed by its LSI, Boeing, and some elements of the current LSI are certain to be broken out. The Coast Guard's Deepwater program is in the process of reverting to government control. Both of these programs will serve as examples to other agencies' LSIs when they transition back to government control. Lastly, we explored the implications of this legislative change on the Army's FCS program, which will be required to restructure its acquisition strategy to resume government integration responsibilities.

The next section of this paper presents recommendations for how services, specifically the Army, should adapt to the new statutory environment that bans the use of LSIs.

SUMMARY AND RECOMMENDATIONS

Summary

Previous sections of this paper have described the evolution to LSI-type contracts as a natural acquisition strategy adaptation for government programs of increased system complexity during an era of reduced government acquisition expertise. The Army's FCS program is an LSI-type program as well—a highly-complex SoS that is intended to transform the Army's ability to fight on the future battlefields. A literature review of LSI program performance ascertained that LSI-type programs have not met expectations in resolving management challenges related to large-scale SoS developments like FCS. Similar performance concerns are associated with the FCS program, including concerns that FCS will experience significant cost growth, schedule slippage and reductions in capability to be fielded. The documented evidence suggests that LSI-managed programs experience similar problems that government-led programs have previously experienced - a principle rationale cited for the migration to industry-led teams initially. These types of contracts also reduce transparency (government visibility of program status) and offer opportunities for potential conflicts of interest.

Changes directed by Congress to remedy the problems associated with LSIs have been presented; principally, the banning of this type of contract after October, 2010. Two programs, MDA's GMD program and the Coast Guard's Deepwater program, will transition from LSI-type management to government control sooner than similarly structured programs, and will serve as potential examples to other services' programs. Lastly, implications of the new legislative direction for the Army's FCS program have been discussed.

Recommendations

As discussed in the introduction to this paper, acquisition reform is a continuous process that describes adaptive behavior among the military services (or other government agencies, like Homeland Security), Congress, and industry. The modern era of acquisition reform results from the Packard II commission findings that led to significant privatization of formerly government roles in acquisition. Prime contracts were one result of the Packard-inspired reforms, whereby contractors assumed the role of

subcontract management on major defense acquisition programs. LSI contracts take the privatization initiative to the logical extreme by shifting responsibility for nearly all government responsibility—including requirements determination, system trades, source selection and program management—to a single, lead contractor, or LSI. Congress' banning of this practice has not changed the underlying rationale, which led to this form of contracting, namely the lack of capable government management for these highly complex programs. A new adaptation is called for wherein the services (government agencies) seek to comply with congressional direction. Herewith are recommendations on how the DoD and the defense services in particular may adapt to the emerging statutory environment.

1. The DoD must comply with congressional direction with regard to LSIs and restore the inherent government capability to manage large, complex SoS programs with in-house, government personnel. The management and integration of large defense programs should be recognized as a capability that is not inherent in industry. The cyclic nature of defense acquisition programs does not support a sizable contractor workforce necessary to continuously monitor, control, direct and integrate traditional work performed by industry partners on defense contracts. It is also suspect that defense contractors will avoid conflicts of interest when assigned the role of program integrator over their fellow industry partners. The government workforce must be both trained and sized to perform its responsibility to maintain proper oversight and understanding of large, complex programs. This workforce must be a permanent fixture within the government, but may include traditional partners like Federally Funded Research and Development Centers (FFRDCs) and University Affiliated Research Centers (UARCs) among the pool of talent to manage highly complex SoS.

2. The service acquisition authorities should consider the establishment of SoS integration and engineering *centers of excellence* or a similar organizational construct. This function, to the extent it currently exists in the DoD, is distributed among Program Executive Office (PEO) staffs, with little service-wide integration, and no central control or authority. SoS programs require cross-PEO and cross functional integration that cannot be met under the current haphazard organization.

These proposed organizations, whether centrally managed or distributed, would provide the capability to manage complex SoS integration and contract management oversight service-wide and obviate the need for an LSI-like contractor.

3. The Office of the Secretary of Defense (OSD), specifically the Undersecretary of Defense for Acquisition, Technology and Logistics, or USD(ATL)—as the Defense Acquisition Executive—should determine, promulgate and enforce an appropriate delineation of roles and responsibilities for government and contractor acquisition workforces. The USD(ATL) should enforce management discipline through the existing milestone decision process, taking care to review sufficiency and competence of government organizations to execute oversight responsibilities. The USD(ATL) should review the adequacy of service management and oversight capability with scrutiny equal to that given other resources required for successful execution of programs. The USD(ATL) should ensure service acquisition workforces are adequate either through the milestone approval authority process (withholding milestone approval when service oversight capability is insufficient), or directly through the annual program budget decision (PBD) process.

4. The DAU, in anticipation of the defense-wide implications of fiscal year 2008 Defense Appropriation guidance, should conduct a taxonomic study to define roles of government and contractor teams respectively. Specific attention must be given to minimizing potential for conflict of interest in the contractor workforce and identification of core-government responsibilities. The DAU should also assess the adequacy and availability of existing training programs in anticipation of building a government workforce of sufficient size and with appropriate skills to manage complex SoS programs. The DAU should also assume a lead responsibility in defining SoS Centers of Excellence roles and responsibilities for service-wide systems engineering and integration.

5. The services should program and budget to support the necessary workforce to manage large, complex programs. Services must develop the long-term manpower solution by accessing appropriate personnel and providing career-long support of

their educational and professional development needs. This workforce should be considered a permanent, professional cadre of acquisition managers, and not subject to cyclic swings in defense and service acquisition budgets.

6. Service acquisition managers must re-consider aggregation of large, complex programs and evaluate the necessity and rationality of systems-of-systems acquisition. If the government workforce is insufficient to the task of integrating these large programs—and industry has had no further success with management of these programs—it is prudent to assess whether programs should be designed of this size and complexity. The rationale previously given for SoS acquisitions is that they are necessary to deliver a fully integrated solution, are less expensive and faster in the long run. But the results of LSI contracts presented in this paper demonstrate just the opposite: these programs are fundamentally at risk as a direct result of their size and complexity. Also, as demonstrated with the FCS program, cost growth jeopardizes the affordability of these programs within the scope of the service acquisition portfolio. Other acquisition strategies exist to develop integrated products affordably, and in a manner that does not overwhelm the government's capability to exercise acquisition oversight. Most recently, spiral development has shown success at delivering integrated capabilities, sooner, albeit in an iterative fashion, on large-scale, complex programs.

Recommendations for Further Research

Future use of LSIs has been banned by Congress, and existing LSIs must eventually transfer management responsibility back to the government. Two programs have begun this process: the Coast Guard's Deepwater program and the MDA's GMD. Capturing lessons learned in the transition of management responsibilities from the LSI to the government on these two programs would benefit all other LSI programs in their respective transition planning.

With the transition from LSIs to government control, government acquisition managers are still without a clear delineation of roles and responsibilities. A detailed

mission analysis of acquisition program management functions should be undertaken to identify core government responsibilities that cannot be shifted to a contractor.

SoS acquisitions have fared poorly in the areas of cost, schedule and performance. The use of LSIs is an adaptation by acquisition managers to address the complex nature of managing SoS, but this strategy has proved unsuccessful. Further research should focus on 1) the criteria for selecting a SoS approach, specifically addressing program realism in terms of risk and affordability; and 2) the availability of acquisition strategies, beyond LSI, that may be successful in managing complex SoS (e.g., spiral development).

LIST OF ACRONYMS USED

ACAT	Acquisition Category
BMDS	Ballistic Missile Defense System
CBO	Congressional Budget Office
CRS	Congressional Research Service
DARPA	Defense Advanced Research Projects Agency
DAU	Defense Acquisition University
DHS	Department of Homeland Security
DoD	Department of Defense
EM1	Engineering Maturity 1
FCS	Future Combat Systems
FFRDC	Federally Funded Research and Development Center
GAO	Government Accountability Office
GMD	Ground-based Mid-course Defense
LCS	Littoral Combat Ships
LRIP	Low-Rate Initial Production
LSI	Lead System Integrator
MDA	Missile Defense Agency
OSD	Office of the Secretary of Defense
PBD	Program Budget Decision
PEO	Program Executive Office
RDT&E	Research, Development, Test and Engineering
SoS	System of Systems
TSAT	Transformational Satellite Communications System
UARC	University Affiliated Research Center
USD(ATL)	Undersecretary of Defense, Acquisition, Technology and Logistics

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